cipline that constitutes the black art of the calculus method. He can do dynamical problems without the aid of confusing formulæ; he can measure the volume of a tree; he can enclose land economically; he can draw tangents and normals; he can find radii of curvature; he can even solve differential equations. The authors, having recognised this fact, have acted upon it boldly and frankly, with the result that they have produced a book of a peculiarly suggestive and persuasive kind. Both authors are experienced teachers of mathematics, and the practical touch introduced by the physical propensities of one of them is everywhere noticeable. It is also refreshing to see $dy/dx=f(x)$ treated as a differential equation.

The merit of the book is somewhat marred by a few faults, and especially by the mediocre diagrams. Some are not well produced, whilst others are not even well drawn. The authors, or their artistic representative, seem to have an unfailing belief that a circle in perspective can be represented by two circular arcs intersecting at sharp angles. This is a gratuitous trap for the unwary.

The style is splendid. The preface is worth reading for its own sake, whilst the historical sketch with Isaac Barrow's prayer will interest even such students as are not excited by Guldinus's and Pappus's theorems.

(4) Many teachers have experienced the want of books on mechanics more advanced than the easy text-books used in schools, and not so advanced as the larger treatises intended for specialists in mathematics. Mr. Fawdry's books are supplying this want, and the present volume is a further contribution to the author's series of books on mechanics. This volume forms the second part of his "Dynamics," and discusses such subjects as differentiation and integration as used in dynamics, harmonic motion, and easy two-dimensional rigid dynamics. The work is well done. The experimental hints, the numerical illustrations of dynamical laws and results, and the very practical examples all help to make the subject attractive and intelligible. There is some lack of logic in the arrangement, and the impression one gets is that of scrappiness. The chapter on harmonic motion, *e.g.*, seems out of place in the middle of a discussion of rigid dynamics.

Mr. Fawdry wastes time in proving that the acceleration d^2x/dt^2 can be written vdv/dx. Surely it must be a part of fundamental dynamical doctrine that:

Number of units of force = time rate of momentum;

Number of units of force = space rate of kinetic energy.

This saves much trouble and memory-searching. One cannot feel angry with a student who forgets the trick of "multiplying by twice the velocity" to get the energy equation.

The figure on p. 271 is unfortunate: when a spiral spring is stretched, the pitch is increased.

One can heartily recommend this as a sound book that will be found very useful both in itself and as an introduction to the larger treatises on the subject.

(5) The fact that a new edition is called for of Prof. Heath's "Solid Geometry" proves that it has been found to serve its purpose as an introduction to those parts of the subject that are required for their practical usefulness. The book, while making no pretence to pedagogical originality, is a very good collection of the most useful theorems and problems in solid geometry. It includes the geometry of the regular solids, spherical geometry, and the mensuration of the sphere. There are a large number of examples with some hints for their solution.

S. BRODETSKY.

VAGUENESS AND DISCRIMINATION.

(1) *The Intuitive Basis of Knowledge. An Epistemological Inquiry.* By Prof. N. O. Lossky. Authorised translation by Nathalie A. Duddington. With a preface by Prof. G. Dawes Hicks. Pp. xxix + 420. (London: Macmillan and Co., Ltd., 1919.) Price 16*s*. net.

(2) *Cultural Reality.* By Dr. Florian Znaniecki. Pp. xv + 359. (Chicago: The University of Chicago Press; London: Cambridge University Press, 1919.) Price 2.50 dollars net.

IT is extraordinary how difficult it seems to be (and how fearfully long the argument is) to convince a man that what he is quite ready to believe, until you make him doubt it, is true. Natural realism—the theory that the objects of knowledge are in themselves what they are represented to be in our knowledge, that knowledge is the discrimination by the mind of a reality awaiting discrimination—is, I suppose, the philosophical theory of knowledge we all hold until we are philosophers consciously philosophising. Tables and chairs are just tables and chairs, and would be such, so far as their essential form and matter are concerned, were there no mind, or, as the realist prefers to say, were there no act of discrimination, in the universe. We all believe it, but let us once challenge a realist philosopher to prove it—he may be able to, but, unlike the Rabbi called on to expound the whole of the law and the prophets, not while you stand on one foot.

(1) Prof. Lossky's "Intuitive Basis of Knowledge" is admirably translated and very clear and easy to read. The translator, Mrs. Duddington, is eminently qualified for the work, not merely by her knowledge of the original language, but also by what is far more important, her complete sympathy with the philosophical view of the author. The book is prefaced by a particularly lucid "Introduction" by Prof. G. Dawes Hicks, who, though not in entire agreement with the author, is very sympathetic towards his point of view. Prof. Hicks expresses surprise that a professor in a Russian university should have reached conclusions so strikingly in accord with his own, but, though Petrograd may be a long way from London, it is no further from

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Berlin and the German universities than London is, and Prof. Lossky is known to many of us by his part in the International Congresses of Philosophy. He is, in fact, thoroughly cosmopolitan so far as his qualifications in philosophy are concerned. The title of his book might lead the reader to expect a theory in accord with some of the more noticeable modern developments, such as Bergson's doctrine of instinct or Croce's æsthetic activity, but intuition has not any such distinctive meaning for Prof. Lossky. He means by the intuitive basis of knowledge merely the vagueness with which the object of knowledge exists undiscriminated, before it is discriminated. This, of course, is the crucial point of realist theory. What it has to account for primarily is "vagueness," in the precise and not vague meaning of the term. According to the realist theory, tables and chairs are, so far as their basis in reality is concerned, the same for men and for guinea-pigs. Apart from acts of discrimination, men and guinea-pigs are on one level of knowledge. What is that? Well, the answer is what the realists are trying to give us, and perhaps if we are patient and allow them time enough they will succeed.

(2) It is not easy to indicate any particular connection between Prof. Lossky's book and Dr. Znaniecki's "Cultural Reality." Their names might suggest that they share an Eastern European viewpoint, if such there be. But, as Dr. Znaniecki is lecturer in the University of Chicago, it is not surprising that the philosophy of the New World—Pragmatism and New Realism—mainly occupies his attention. "Culturalism" is the thesis that there are an objective reality and a subjective adaptation that both change, and change more profoundly than can be expressed by the advance of knowledge by discrimination. It is an attempt to blend the realist theory that there is an object on which the only mental work is discrimination with the pragmatist theory that we make truth. The idea apparently is that from the two separate worlds of things and values there arises a third reality, which is irreducible to either —cultural reality *sui generis*. The primitive material is not conceived as vague, but as a "concrete chaos of historical reality."

H. W. C.

IRON AND STEEL PRODUCTION IN GREAT BRITAIN DURING THE WAR.

The Iron and Steel Industry of the United Kingdom under War Conditions: A Record of the Work of the Iron and Steel Production Department of the Ministry of Munitions. By Dr. F. H. Hatch. Pp. xii+167. (London: Privately printed for Sir John Hunter by Harrison and Sons, 1919.)

ON account of the vastness of the field covered, the variety and complexity of the technical problems involved, and the far-reaching industrial questions raised, the activities of the Iron and Steel Production Department of the Ministry of Munitions during the war form a subject of surpassing interest and importance. The history of this great work has been written by Dr. F. H. Hatch, himself a member of the Department.

The narrative falls naturally into two divisions, namely, (1) that of the small Steel Department which was formed as a branch of the Materials Department, of which Sir Leonard Llewelyn was director, and (2) that of the much larger organisation formed by Sir John Hunter when he became Director of Iron and Steel Production in August, 1916.

Sir John Hunter was confronted with a very difficult task. The demand for various types of steel for munitions and shipbuilding was growing rapidly while the supply of raw materials essential for their manufacture was threatened with curtailment, if not complete suspension, so far as foreign sources were concerned, by the activity of German submarines. The only sound remedy was the development of home resources, but the substitution of lean phosphoric ironstones such as constitute the main portion of British iron ores for the rich ores imported principally from Spain and the Mediterranean, involved such sweeping changes in plant, supplies, inland transport, labour, etc., that it could only have been carried out with difficulty even in peace-time. Under war conditions it was evident that the problem would require the most skilful handling by a carefully organised department. In spite of difficulties which at times appeared to be almost insuperable, Sir John Hunter's "Basic Iron Program" obtained a high measure of success, and enabled the urgent and incessant calls of the great Service Departments for ship plates, shells, and other munitions requiring steel in their manufacture to be punctually and duly met.

It is a remarkable tribute to the inherent but not always obvious organising power of the nation that under the adverse conditions of a great war it should have been possible to raise the steel production of the country to the highest point it has ever reached in the history of the industry. Under the stress of necessity raw materials which had been allowed to lie dormant in this country were rapidly developed and brought to the producing stage. Iron ores in Oxfordshire, coking coal in Scotland, ganister for silica bricks, moulding sands for foundry work, and refractory sands for open hearth furnace bottoms, are instances in point. Whereas in 1913 and 1914 the total steel output was 7·66 and 7·83 million tons respectively, it had risen in 1917 to 9·71 million tons, and during the first half of 1918 it was at the rate of close on 10 million tons per annum. The plans of the Department provided ultimately for an increase to 12 million tons annually. Dr. Hatch suggests two main reasons for the success obtained; these are (1) the trust reposed by Sir John Hunter in the members of his staff, which was entirely reciprocated, and (2) the fact that manufacturers cordially co-operated in the plans of the Ministry and loyally

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